

TAXONOMIC DISTRIBUTION AND PHYLOGENETIC SIGNIFICANCE OF THE MALE FORELEG HAIRPENCIL IN THE TORTRICINAE (LEPIDOPTERA: TORTRICIDAE)¹

John W. Brown²

ABSTRACT: I report for the first time male foreleg hairpencils in the tortricine tribes Euliini, Schoenotenini, and Atteriini. The structures are identical in Euliini and Schoenotenini, and their shared possession is considered a putative synapomorphy for these two tribes. Although similar in structure and point of origin, the hairpencil in Atteriini lies along the anterior longitudinal axis of the femur rather than along the outer base of the coxa as in Euliini and Schoenotenini. The atteriine hairpencil may represent an independently derived structure, or, more likely, a modification of that found in the other two tribes.

Male secondary structures (e.g., costal fold, corema, hairpencil) are common and diverse among exoporian and ditrysian Lepidoptera (Varley 1962; Birch 1972, 1985). Although these structures may be strikingly unique and almost certainly homologous among taxa sharing them, their value in elucidating phylogenetic relationships is diminished by the fact that they are evolutionarily more labile than many other adult morphological features. Shared possession of uniquely derived male secondary structures provides compelling evidence of common ancestry (Birth 1972; Varley 1962), but their absence may be meaningless in a phylogenetic context since the correct position in the transformation series (i.e., primitively absent - present - secondarily lost) may be impossible to determine.

Few characters of the legs of tortricids have been studied on a comparative basis. Examples include the work of Falkovitch (1962) on male secondary structures in Olethreutinae, and that of Yasuda (1972) on tarsal setae of Japanese Tortricinae. Horak (1984) concluded that legs provide few characters useful in resolving phylogenetic relationships within Tortricinae. However, my recent discovery of male foreleg hairpencils among the tortricid tribes Euliini, Schoenotenini, and Atteriini may be useful in demonstrating the monophyly of these taxa and in elucidating relationships among their members.

Hairpencil in Euliini and Schoenotenini

Structure. The foreleg hairpencil in Euliini and Schoenotenini con-

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²Department of Entomology, NHB-127, Smithsonian Institution, Washington, D.C., 20560.

sists of a fascicle of 15-25 slender, pale yellow, hairlike scales, that arise together from the proximal end of the femur and extend along the outer surface of the coxa to near its base (Figs. 1-3). Scales on the trochanter and the distal portion of the coxa form a broad groove that partially conceals the basal portion of the hairpencil. On the thorax near the base of the coxa, there is an invaginated region and associated cuticular flap which receives the distal ends of the hairpencil (Fig. 4). The function of the hairpencil is unknown; presumably it plays a role in dissemination of short-range courtship pheromones. Baker and Carde (1979a, 1979b) and Baker, Nishida, and Roelofs (1981) have shown that male abdominal androconia of *Grapholita* (Olethreutinae), consisting of an eversible membranous sac, are used to release a close-range female attractant.

Taxonomic distribution. The euliine/schoenotenine hairpencil has a sporadic distribution throughout the two tribes (Tables 1 and 2); i.e. the structure is present in 48% of euliine and 43% of schoenotenine genera examined. In addition to those genera listed in Table 1, several undescribed euliine genera and many unplaced species of "*Eulia*" Hübner possess the hairpencil. In some genera all species have the hairpencil; in others it is absent and presumably secondarily lost in one or more species. Its presence in the presumably most primitive as well as the more derived genera of Euliini (Brown and Powell, in prep.) suggests that it represents a synapomorphy uniting the Euliini and Schoenotenini rather than a character derived numerous times within the two tribes.

The Euliini, as recently redefined by Powell (1986), previously was considered a para- or polyphyletic assemblage of primarily Neotropical genera, characterized by symplesiomorphies of male and female genitalia (Horak and Brown 1990). Possession of the hairpencil demonstrates the common ancestry of genera that share this unique structure; however, absence of the hairpencil among several taxa does not necessarily exclude them from the tribe since it may have been lost secondarily. The structure is absent in more than half of the genera included by Powell (1986) in the Euliini; on the basis of this and other characters, a few of these genera likely are assigned incorrectly to this tribe (e.g., *Ecnomiomorpha* Obraztsov, *Deltobathra* Meyrick).

Hairpencil in Atteriini

Structure. In Atteriini, the hairpencil typically consists of a dense brush of > 50 fine, flattened, setalike scales, arising along a narrow patch on the anterior edge of the femur immediately distad of the junction with the trochanter. The scales are shorter in relation to coxa length, more flattened, and greater in number than those in Euliini and Schoenotenini. When not displayed, the hairpencil lies along the longitudinal

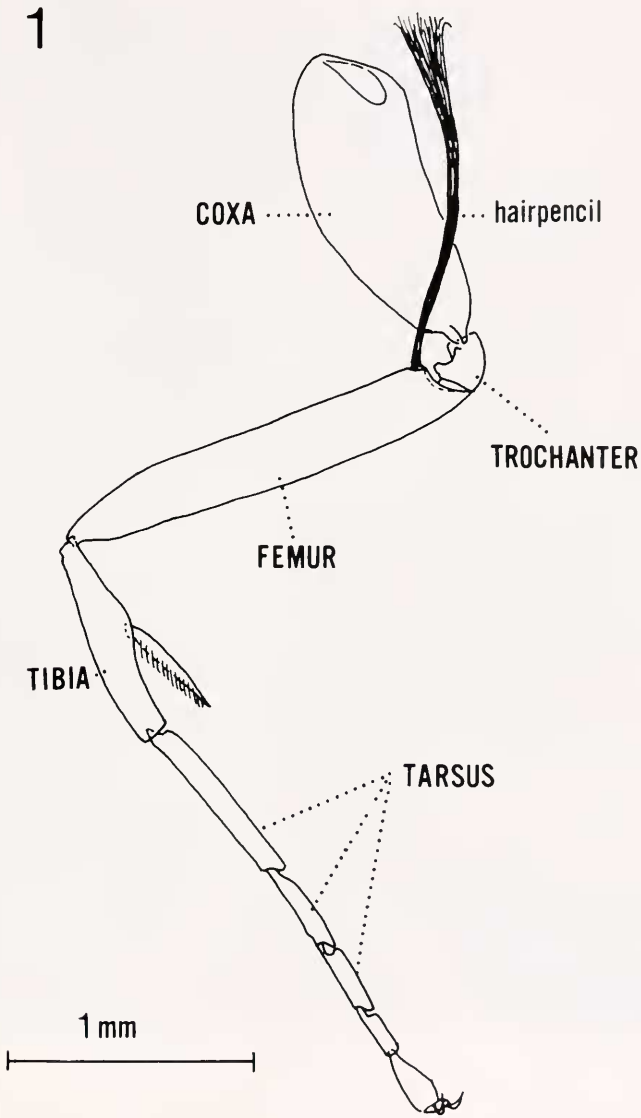
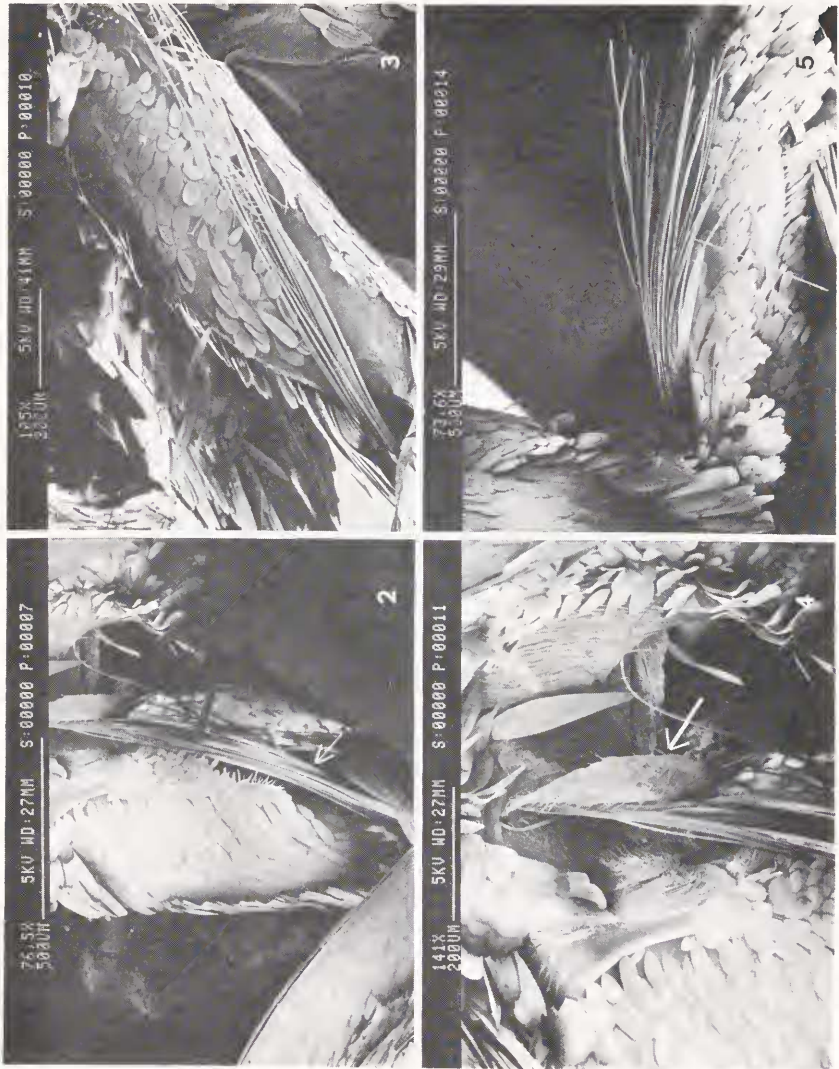


Fig. 1. Diagram of male foreleg illustrating position of hairpencil.



Figs. 2-3. Scanning electron micrograph of hairpencil of *Eulia ministrana* L. (Euliini).
 Fig. 4. Thoracic receptacle of hairpencil in *Eulia ministrana*.
 Fig. 5. Scanning electron micrograph of hairpencil in *Tinacrucis* sp. (Atteriini).

axis of the femur, extending approximately to the distal end of the femur (Fig. 5).

Taxonomic distribution. The foreleg hairpencil is present in seven of eight described atteriine genera; it is absent in the monotypic *Holoptygma* Powell which is the only atteriine with a costal fold. It is absent in one or more species of six of the seven genera (Table 3).

The monophyly of the Atteriini is convincingly demonstrated by the modified "corethrygyne" scales on sterna VI and VII of the female and the correlated oviposition behavior (Powell 1986). The corethryogyne scaling is evidently absent in *Sisurcana* Powell where no unequivocal association of males and females is known (Powell 1986). The unique hairpencil provides further evidence for the monophyly of the Atteriini, as well as confirming the membership of *Sisurcana*.

CONCLUSIONS

Two types of male foreleg hairpencils are found in the Tortricinae, one type in Euliini and Schoenotenini, and the other in Atteriini. The hairpencils are similar in structure, configuration, and point of origin. Consequently, the shared presence of these structures may be interpreted as evidence of the common ancestry of these tribes.

Males of an undescribed genus that possess convincing atteriine genitalia [i.e. "*Philedone*" *aluminias* (Meyrick) and "*P.*" *citrochyta* (Meyrick)], have typical euliine/schoenotenine hairpencils. It is possible that the genus represents an early branch of Atteriini (before the development of the atteriine hairpencil), and that the atteriine hairpencil represents a modification of that found in the Euliini and Schoenotenini. If this interpretation is correct, the character supports relationships unsuspected by previous workers attempting to reconstruct tortricoid phylogeny.

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Table 1. Distribution of male foreleg hairpencil in Euliini ("-" = structure not observable; "F" = genera known only from females).

GENUS	No. of spp. examined	% possession of hairpencil
<i>Acroplectis</i> Meyrick	1	0
<i>Anopina</i> Obraztsov	30	100
<i>Anopinella</i> Powell	8	0
<i>Apolychrosis</i> Amsel	4	0
<i>Apotomops</i> Powell	2	0
<i>Bicavernaria</i> Razowski	1	100
<i>Bonagota</i> Razowski	6	0
<i>Chicortrix</i> Razowski	1	100
<i>Chileulia</i> Powell	1	0
<i>Chilips</i> Razowski	2	-
<i>Chrysoxena</i> Meyrick	1	0
<i>Clarkenia</i> Razowski	5	0
<i>Clarkeulia</i> Razowski	18	83
<i>Coryssovalva</i> Razowski	1	0
<i>Deltinea</i> Pastrana	1	0
<i>Dorithia</i> Powell	17	0
<i>Eriortrix</i> Razowski	2	100
<i>Ernocornutia</i> Razowski	2	100
<i>Ernocornutina</i> Razowski	1	100
<i>Eulia</i> Hübner	1	100
<i>Gauruncus</i> Razowski	3	100
<i>Helicteulia</i> Razowski	1	100
<i>Hynhamia</i> Razowski	3	67
<i>Inape</i> Razowski	10	90
<i>Neoulia</i> Powell	1	0
<i>Nesochoris</i> Clarke	2	0
<i>Oregocerata</i> Razowski	1	-
<i>Orgyuncus</i> Razowski	1	-
<i>Ortognathosia</i> Razowski	1	0
<i>Paraptila</i> Meyrick	4	100
<i>Popayanita</i> Razowski	2	50
<i>Proeulia</i> Clarke	20	85
<i>Pseudomeritastis</i> Obraztsov	4	75
<i>Pryongnathosia</i> Razowski	1	100
<i>Quasiulia</i> Powell	1	0
<i>Rhythmologa</i> Meyrick	1	F
<i>Seticosta</i> Razowski	15	100
<i>Silenis</i> Razowski	3	100
<i>Telurips</i> Razowski	1	0
<i>Terinebrica</i> Razowski	5	100
<i>Uelia</i> Razowski	1	0
<i>Uncicida</i> Razowski	1	0

Table 2. Distribution of male foreleg hairpencil in Schoenotenini ("F" = genera known only from females).

GENUS	No. of spp. examined	% possession of hairpencil
<i>Antigraptis</i> Meyrick	1	F
<i>Archactenis</i> Diakonoff	2	100
<i>Barygnathella</i> Diakonoff	9	0
<i>Campotenes</i> Diakonoff	4	50
<i>Choristenes</i> Diakonoff	1	F
<i>Cornuticlava</i> Diakonoff	3	33
<i>Copidostoma</i> Diakonoff	1	F
<i>Diactenis</i> Meyrick	1	0
<i>Homalernis</i> Meyrick	2	F
<i>Litotenes</i> Diakonoff	1	100
<i>Metachorista</i> Meyrick	6	0
<i>Neotenes</i> Diakonoff	1	100
<i>Rhopalotenes</i> Diakonoff	4	100
<i>Rhabdotenes</i> Diakonoff	6	100
<i>Schoenotenes</i> Meyrick	7	100
<i>Stenotenes</i> Diakonoff	2	0
<i>Saetotenes</i> Diakonoff	6	100
<i>Oligotenes</i> Diakonoff	2	0
<i>Orthocomotis</i> Dognin	25	0
<i>Paracomotis</i> Razowski	1	0
<i>Protarchella</i> Diakonoff	3	33
<i>Proactenis</i> Diakonoff	1	0
<i>Zenotenes</i> Diakonoff	1	0

Table 3. Distribution of male foreleg hairpencil in Atteriini.

GENUS	No. of spp. examined	% possession of hairpencil
<i>Anacrusis</i> Diakonoff	8	88
<i>Archipimima</i> Powell	3	67
<i>Atteria</i> Walker	4	100
<i>Holoptygma</i> Powell	1	0
<i>Sisurcana</i> Powell	4	25
<i>Templemania</i> Busck	4	25
<i>Tina</i> Powell	1	100
<i>Tinacrusis</i> Powell	3	67

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BOOKS RECEIVED AND BRIEFLY NOTED

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Each species account provides detailed collection and distribution data, accompanied by a range map. Species accounts also contain substantial ecological information. One new species is described. A key to the butterflies of Hispaniola is included.

ECOLOGY AND NATURAL HISTORY OF TROPICAL BEES. D.W. Roubik. 1989. Cambridge University Press. 514 pp. 22 pl. \$69.50

This book summarizes and interprets worldwide research on the diversity of bees, emphasizing their function within the tropical biota and including their interaction with human populations. The book draws together several major themes of ecology, natural history, and evolution and is intended to be a reference for research workers in the field.